

Artificial Reefs as a Component of Maryland's Marine Spatial Planning Efforts

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Attraction vs. Production

Attraction

Do artificial reefs attract/aggregate fish for easier angling access?

vs.

Production

Do artificial reefs help to increase fisheries production?



David Noss

Attraction vs. Production

“Artificial reefs are now believed to be more of a continuum, both attracting and enhancing fish populations. Properly constructed, and strategically sited artificial reefs can enhance fish habitat, provide more access to quality fishing grounds, benefit fishermen, divers and the economies of shore communities, increase total biomass in a given area and provide managers with yet another option for conserving, managing, and developing fisheries resources.”

- 8th Conference on Artificial Reefs and Artificial Habitats

Structural Heterogeneity of Reefs

- High topographic relief
- Complex 3-D structure
- Increased edge effect
- Patchwork of macro-& microhabitats
- Modify circulation patterns
 - hydrologic environment
 - deposition processes



Ecological Functions of Reefs

- Refuge
 - Dimension and orientation affect functionality
 - decreased mortality
 - Facilitate reproduction
- Forage
 - increased prey diversity
 - increased nutrient cycling pathways (foodweb complexity)
- Biogenic – maintain themselves
- Biogeographic staging posts for dispersal (stepping stones)

Reefs Benefit Non-target Species

Such as:

- Sessile species
 - Oyster
 - Bryozoans
 - Tunicates
- Structure dependent species
 - Blennies
 - Gobies
 - Toadfish

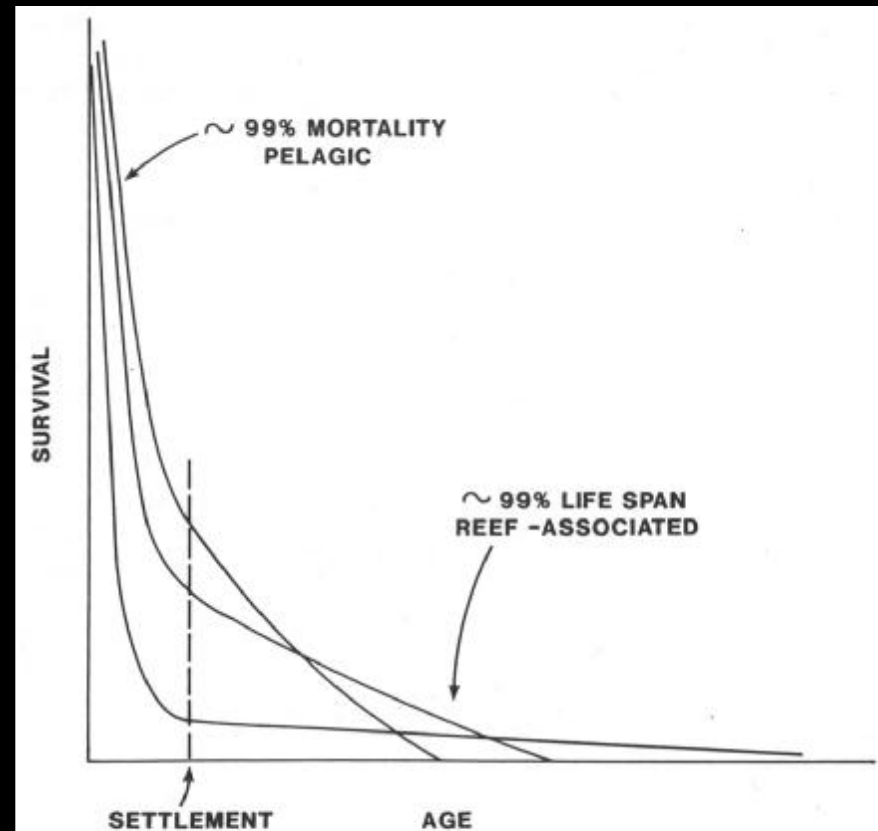


John Foster



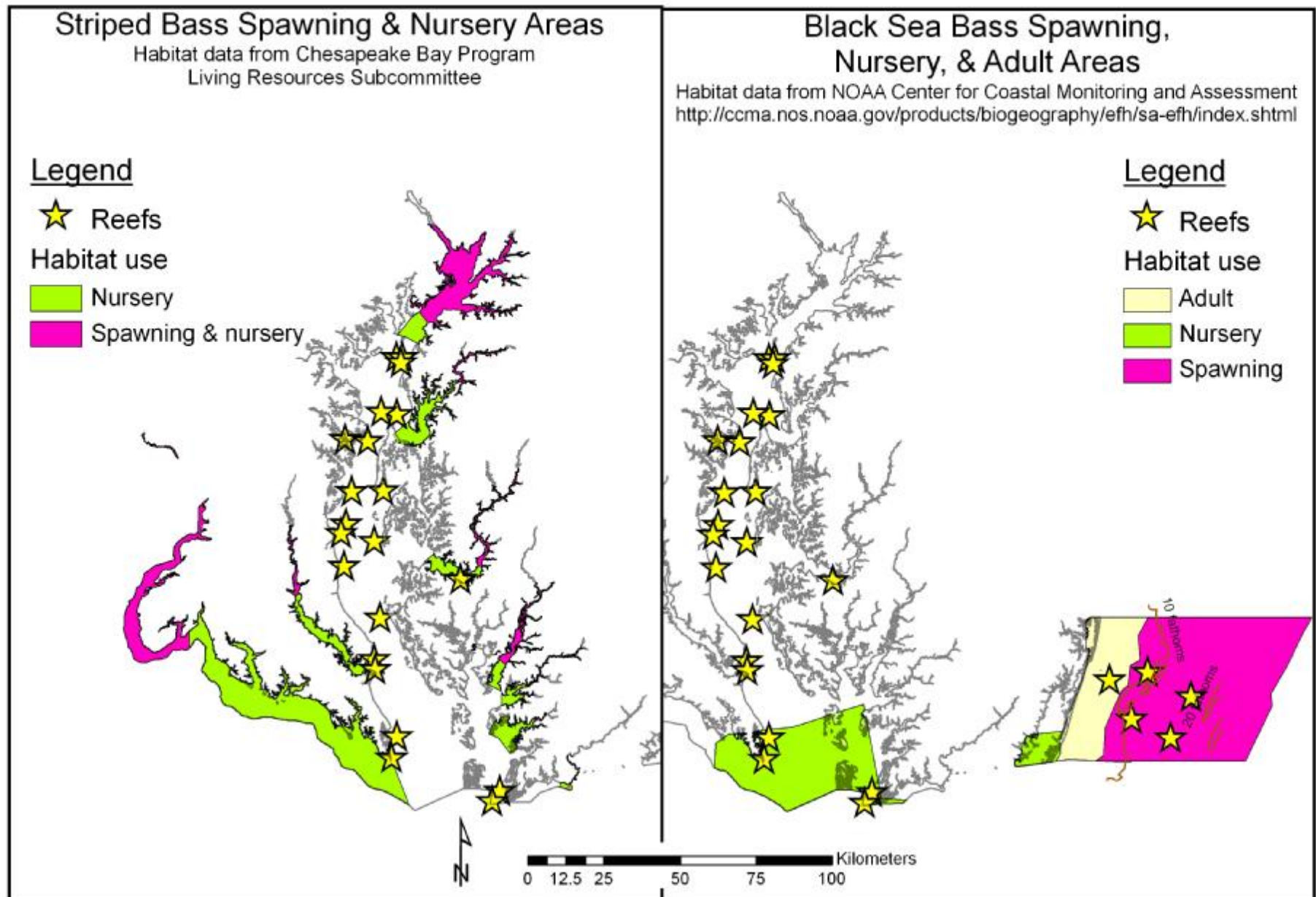
How Can Reefs Enhance Fish Populations?

- Abundance (more individuals)
 - Reduce natural mortality
 - Significant for larval and young-of-year
 - Increased available refuge
 - Increased juvenile, adult & spawning habitat
- Biomass (larger individuals)
 - Increase growth rate
 - Diverse prey field
 - Increased foraging efficiency



Effect of larval and juvenile survivorship on cohort size (from Sale, P. F. ed. 1991. The ecology of fishes on coral reefs, San Diego: Academic Press, Inc.)

Do MD Artificial Reefs Effect Population Bottlenecks?



Would Artificial Reefs Enhance
Target Fish Populations?

Target Species Enhancement Likelihood

Species	Abundance (provides refuge)	Biomass (provides prey)
Black seabass	Yes	Yes
Tautog	Yes	Yes
Cunner	Yes	Yes
Scup	Yes	Yes

Target Species Enhancement Likelihood

Species	Abundance (provides refuge)	Biomass (provides prey)
Atlantic croaker	Some	Yes
Spot	Some	Yes
Red drum	Some	Yes
King mackerel	Some	Yes
Bluefish	Some	Some
Summer flounder	Some	Some
Weakfish	Some	Some
Spotted seatrout	Some	Some
Black drum	Some	Some
Striped bass	No	Yes

Target Species Enhancement Likelihood

Species	Abundance (provides refuge)	Biomass (provides prey)
White perch	No	Some
Spotted hake	No	Some
Catfish	No	No
Yellow perch	No	No
Pollock	No	No
Red hake	No	No
Northern kingfish	No	No

Issue Summary

- Ecological function of artificial reefs varies among species
- Artificial reef development enhances angler access and opportunity
- Impacts on fish populations from angling at artificial reef sites is unclear

Recommendations

Evolution of Current Artificial Reef Management Plan

ARTIFICIAL REEF MANAGEMENT PLAN FOR MARYLAND



photo courtesy of Greg Hall

Prepared By:
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under
Maryland Environmental Service Contract 06-07-58

June 2007

- Prior to adoption, some recommendations should be vetted through a similar stakeholder-based process as was employed during Plan development.
- Existing Plan primarily focused on the provision of fishing opportunities.

Develop a “Marine Spatial Plan”

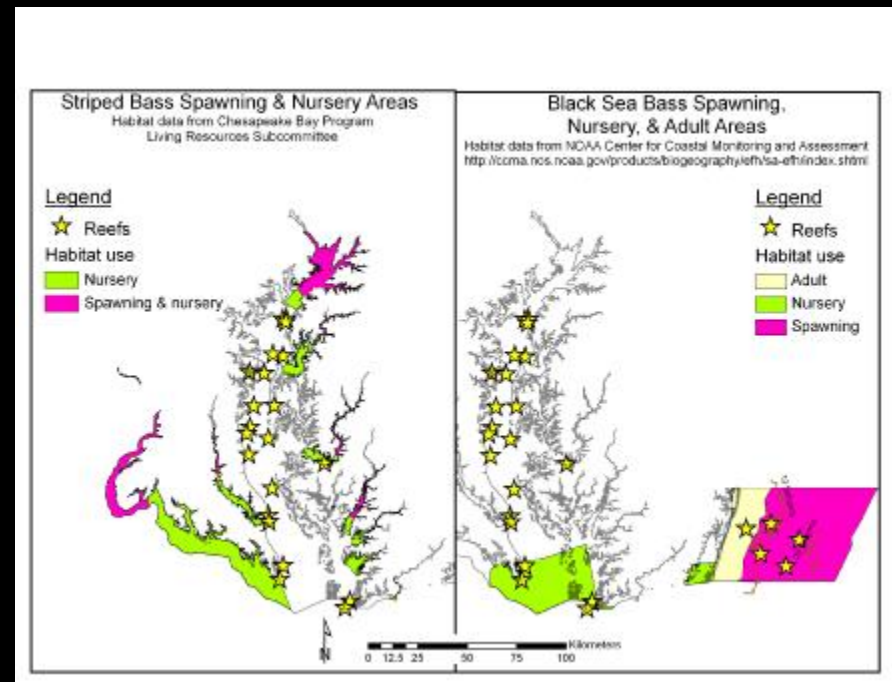
- Delineate areas of use
 - Current and future artificial reef development areas
 - Fishery areas
 - trawl, dredge, drift gill net, and pots
 - Oyster bar restoration
 - SAV restoration
 - Infrastructure development
 - Energy development and associated infrastructure
 - Marine Protected Areas
- Delineation of fishery and development zones (envelopes) is necessary to minimize stakeholder conflicts.
- Evaluate artificial reef proximity to natural reef systems for connectivity
- Multi-use areas better leverage funds to complete projects.

Designate “no take” or “protected areas”

- Provide protected habitat structure for fish during one or more of their life stages.
- Monitoring of protected and exploited reefs would contribute to understanding of fish attraction and production.

Explore feasibility of developing shallow water artificial reefs

- Habitat enhancement for young-of-year and juvenile finfish
- Could serve as sites for shellfish enhancement projects.



Cost/Benefit Analysis

Complete a cost/benefit analysis of fish population enhancement by reef development versus regulatory action.

- Artificial reef development is expensive
 - Materials, transport, labor, and monitoring
- Regulatory actions are low cost to implement
 - May significantly impact associated economies
 - Enforcement cost and success may vary

Artificial Reef Monitoring Program

- Develop a fully funded and statistically sound monitoring program.
 - Current monitoring is limited and not standardized.
 - Insufficient data to evaluate structural and biological condition of reef projects.
 - Monitoring and research framework exists in the 1994 CBP Aquatic Reef Habitat Plan.
 - Incorporate this monitoring program into the current and future artificial reef program.

Plan Recommendations

- **Enhance the section discussing attraction vs. production in the MD Artificial Reef Management Plan.**
 - Discuss how management actions or construction of reef structures can address this issue.
 - Inclusion will give context for when and where reef development may be beneficial.
- **Revise target finfish species information to better reflect actual fish community composition and likelihood of population enhancement.**
 - Reef fish communities will vary among oligohaline/mesohaline, polyhaline, and coastal ocean (continental shelf) waters.
 - Utilization of reef structure by fish will vary life history stage.
 - Several fish species listed are poor candidates for population enhancement or access enhancement by reef construction (yellow perch, catfish, red hake, pollock, northern kingfish).



MD DNR MARI



Jason Taylor, Grenada



Discussion



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Discussion

- How can artificial reefs facilitate access and better enhance fish stocks?
 - Are appropriate habitat bottlenecks addressed?
- Does productivity gain at artificial reefs [assuming there is] offset fishing mortality?
- Does artificial reef site designation and design maximize the leverage of funds AND mitigate user conflicts – fisheries, energy, transportation, telecommunications, conservation, recreation, etc.?

Historic Oyster Bars

